

CAVE CREEK DRAINAGE MASTER PLAN

Implementation Plan

Cave Creek, Arizona

FINAL

Prepared for:



2/13/08

DATE

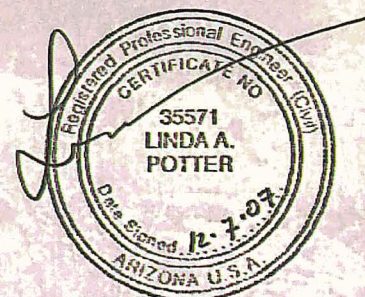
Flood Control District of Maricopa County
Contract No. FCD2004C072

Prepared by:

HDR | ONE COMPANY
Many SolutionsSM

3200 East Camelback Road
Suite 350
Phoenix, Arizona 85018-2311
602-522-7700

December 7, 2007



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1.0 INTRODUCTION

1.1 Purpose of Study

This report summarizes the implementation strategies for the Cave Creek Drainage Master Plan (DMP). The purpose of the implementation plan is to:

- Identify potential funding sources for implementation of the recommended alternative;
- Evaluate the need for modifications to existing ordinances to ensure implementation of the plan; and
- Identify key opportunities and constraints for implementation.

1.2 Authority for Study

The Flood Control District of Maricopa County (District) has retained HDR Engineering, Inc. (HDR) to prepare this study under Contract No. FCD 2004C072 as part of the Cave Creek DMP.

1.3 Acknowledgements

The Implementation Plan was prepared by LTM Engineering, Inc., and HDR. The project manager for the District is Ms. Felicia Terry. The HDR project manager is David Buras and the project manager for LTM Engineering is Laurie T. Miller.

1.4 Location of Study

The project is located in northern Maricopa County, Arizona. The study area is shown in *Figure 1.4.1* and generally consists of the Town of Cave Creek (Town) and a small portion of adjacent unincorporated county land.

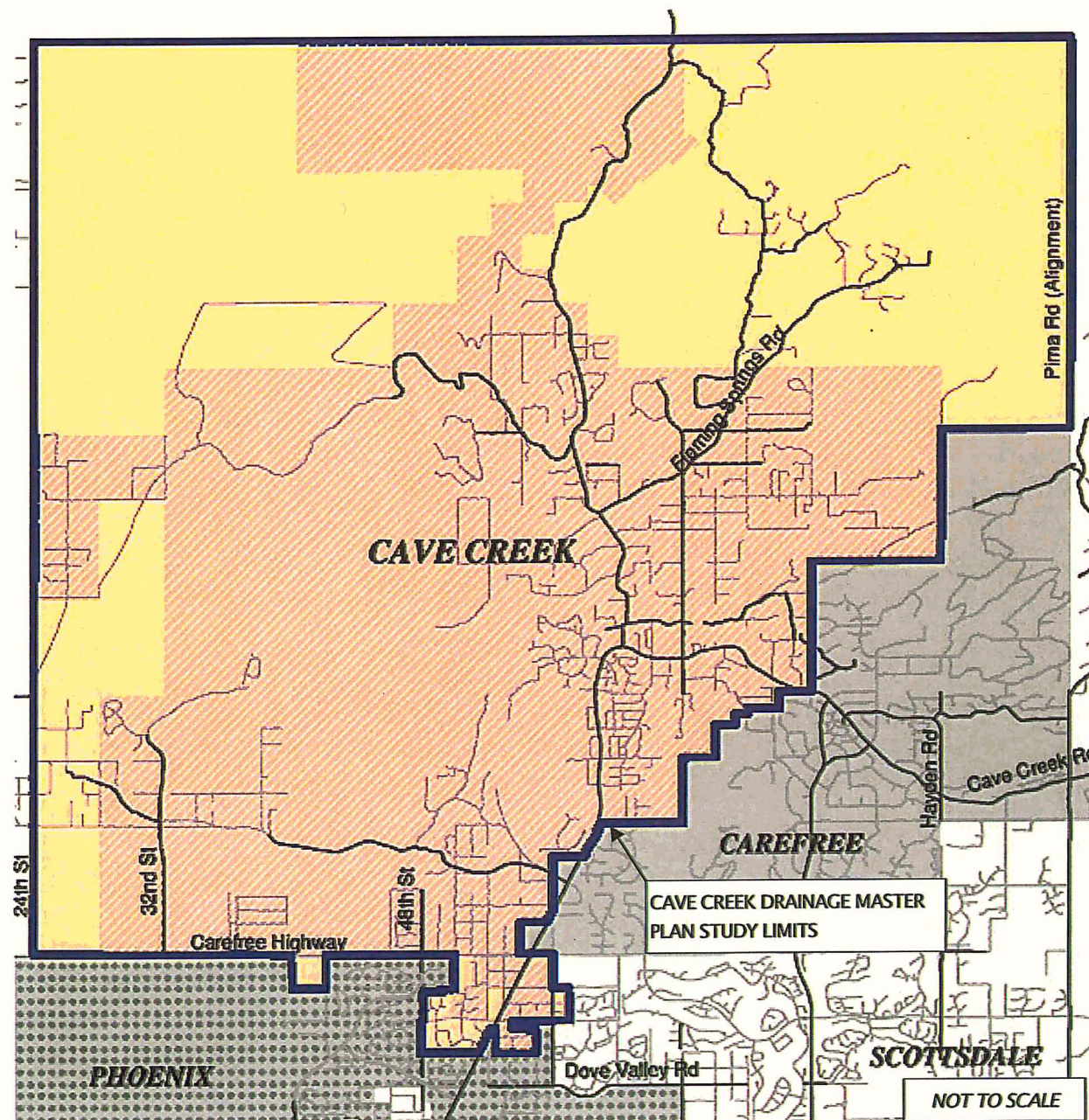


Figure 1.4.1: Study Area

2.0 RECOMMENDED ALTERNATIVE

The recommended alternative for the Cave Creek DMP includes the following elements:

Completed as part of the DMP final report:

- Identification of wash corridors
- Delineation of additional floodplain mapping
- Identification of erosion hazard setbacks
- Erosion Monitoring Program for identified lots
- Updated Grading and Drainage Design Guidelines
- Flood Response Plan

Remaining elements for future implementation:

- Construction of three all-weather access improvements across major washes on School House Road and two all-weather access improvements across major washes on Spur Cross Road
- Construction of culvert crossings of Cave Creek Road at Unnamed Central Tributary to Cave Creek and Mormon Girl Wash
- Realign 24th Street (identified previously in the Adobe Dam/Desert Hills ADMP)
- Future improvements to the Cave Creek Flood Response Plan
- Recommended code enforcement to remove existing obstructions within washes
- Floodprone Properties Acquisition Program (FPAP)
- Education program

This implementation plan addresses strategies for implementation of the remaining elements of the DMP.

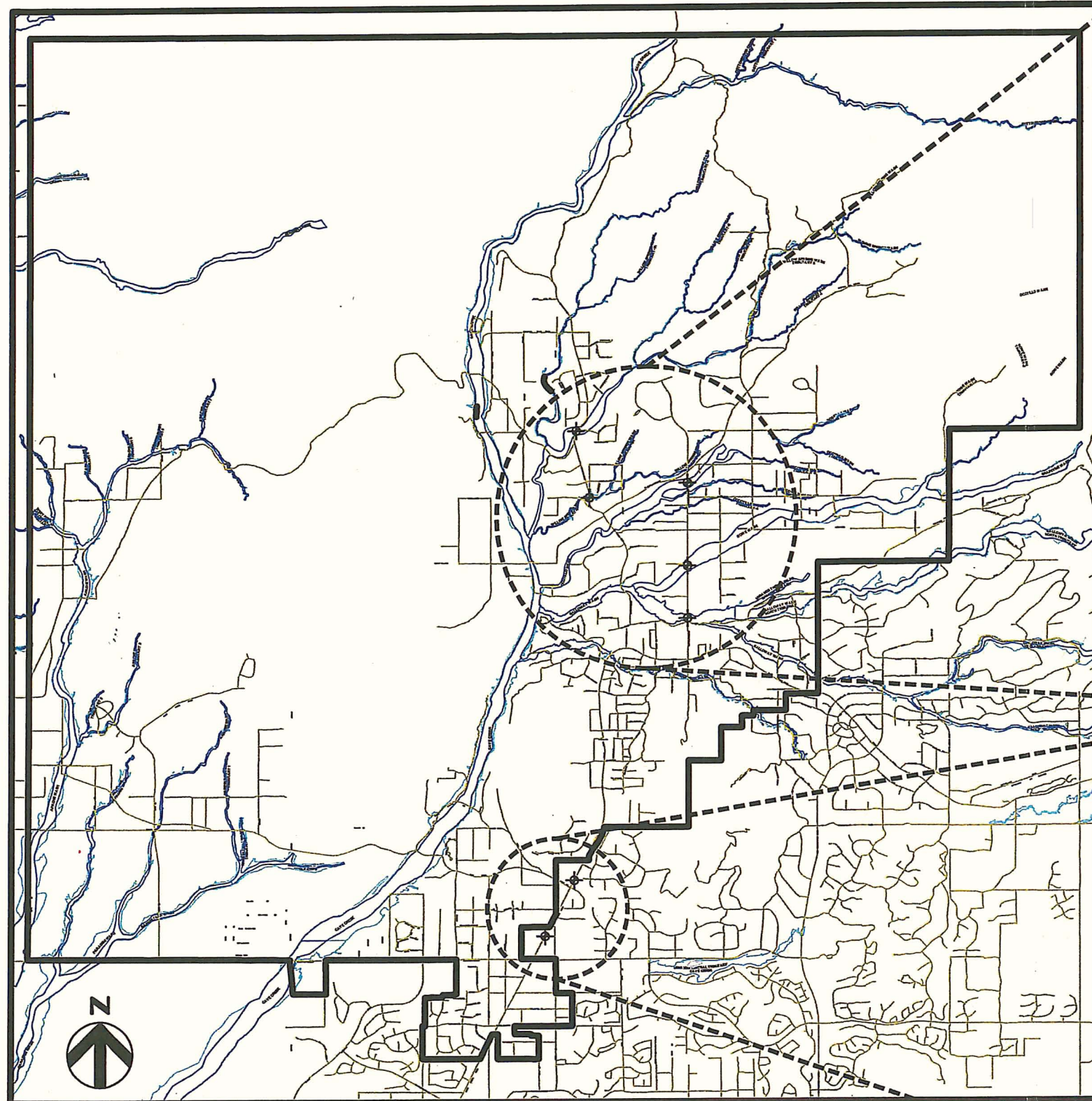
2.1 All-Weather Access Improvements

During significant rainfall, Cave Creek and its tributaries flood the at-grade road crossings and prevent access through most of the Town. This poses safety concerns because it prevents emergency response and operational concerns because roadways are not passable. In addition, the roadways may suffer heavy damage during major events. For example, the Town Council recently approved repairs to School House Road and Spur Cross Road as a result of extensive damage during the July 31, 2007 flood (shown below in *Figure 2.1.1*).



Figure 2.1.1: Flood Damage

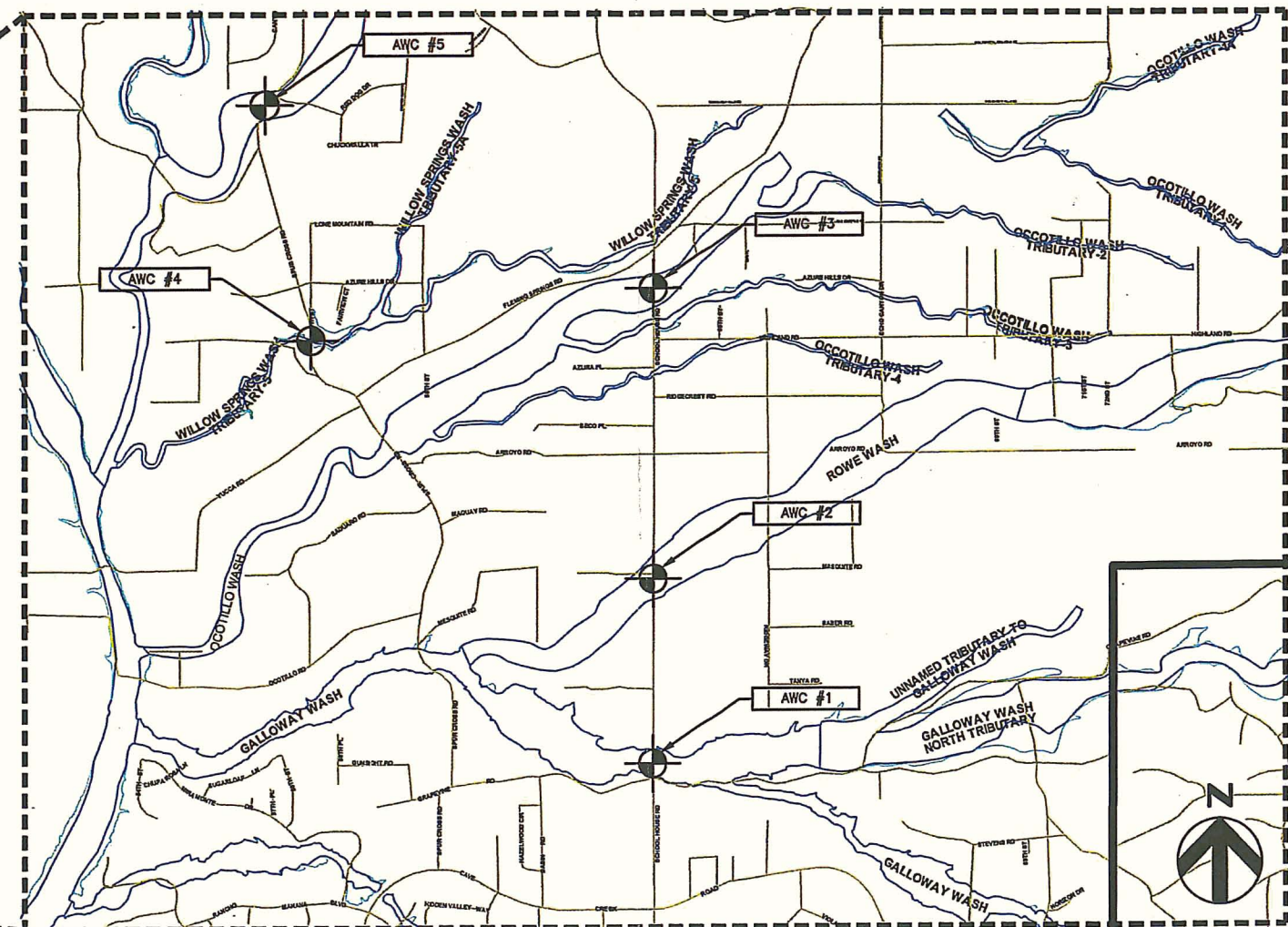
Phasing for these elements should be based on the number of residents served, traffic counts, and connectivity to existing all-weather routes. In general, the crossings closest to Cave Creek Road would be constructed first in order to provide continuous all-weather access. It is recommended that the three all-weather access improvements for School House Road be constructed first, followed by construction of the two all-weather access improvements for Spur Cross Road. Refer to the Proposed Access Improvements map located on the next page for illustration of the locations with respect to the Town.



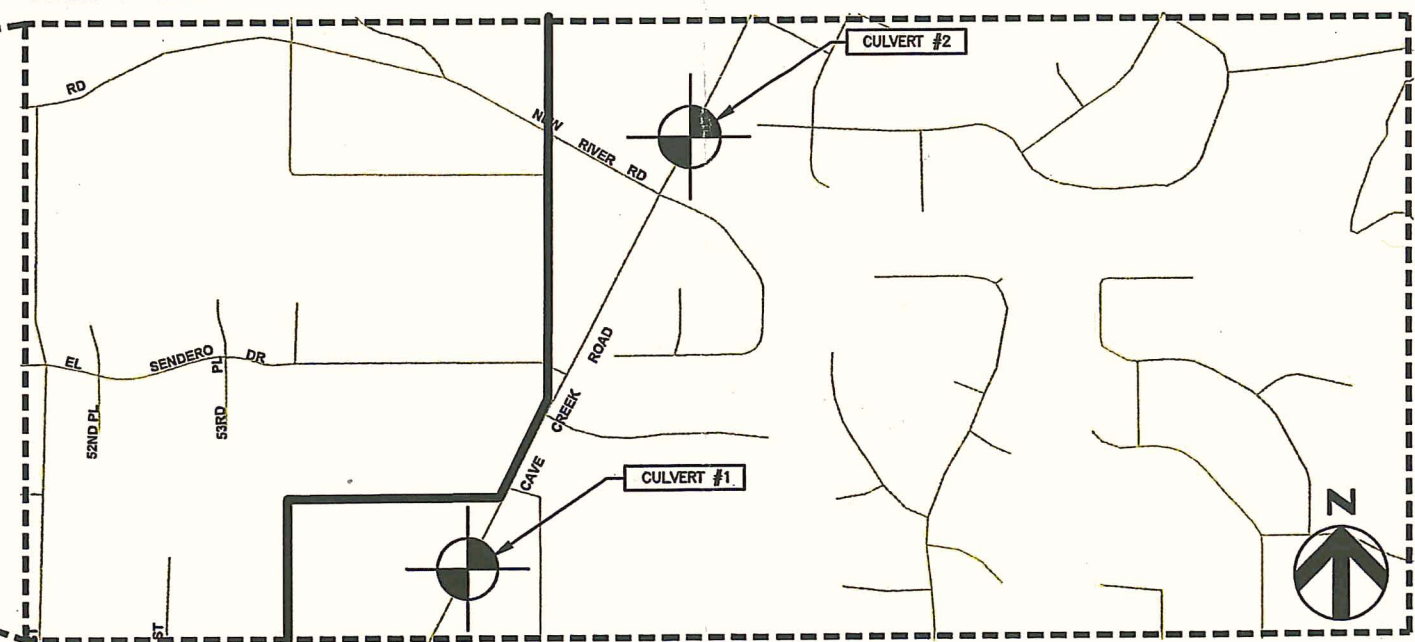
SCALE: 1"=5000'

LEGEND

- | | |
|-------------------|--|
| AWC #1 | ALL WEATHER ACCESS CROSSING IMPROVEMENT LOCATION |
| | *GALLOWAY WASH *WILLOW SPRINGS WASH |
| | *ROWE WASH *WILLOW SPRINGS WASH TRIBUTARY-5 |
| | *OCOTILLO WASH |
| CULVERT #1 | ALL WEATHER ACCESS (CULVERT) LOCATION |



SCALE: 1"=2000'



SCALE: 1"=1000'

HDR

CAVE CREEK DRAINAGE MASTER PLAN PROPOSED ACCESS IMPROVEMENTS

DATE

FIGURE

IMPV-01

Figure 2.1.2: Proposed Access Improvements

2.2 Culvert Construction

A portion of the study area contains a wash which is subject to variable flow conditions resulting from an upstream flow split condition. The wash, designated as Mormon Girl Wash (or Unnamed Central Tributary to Cave Creek), splits into two tributaries near Carefree Highway and Terravita Way in the Town of Carefree. Culverts constructed at the crossings of the wash with Cave Creek Road would allow all-weather access.

2.3 24th Street Realignment

24th Street is the western border of the Cave Creek DMP. Realignment had been recommended by others as part of the Adobe Dam/Desert Hills ADMP. It is included here because the project has not been implemented to date.

2.4 Future Flood Response Plan Improvements

Several enhancements were recommended for the Cave Creek Flood Response Plan in order to provide improved accuracy in predicting flood threat and longer lead times for the Town to respond to an emergency. Improvements included additional precipitation and stage gages, and installation of crest gages at selected road crossings.

2.5 Code Enforcement

In order to preserve the function and natural beauty of the drainage system within the Town of Cave Creek, it is critical that drainage regulations be enforced. There are a number of documented locations within the study area where washes have been partially filled in and where obstructions such as block walls have been placed. Rapid growth in the area has created significant staffing challenges for the Town. In order to keep abreast of building inspection and code compliance, the Town should consider comparably increasing its staff.

2.6 Floodprone Properties Acquisition Program

Two residences were identified within new or existing floodways:

- Ocotillo Wash – 40647 N. Fleming Springs Road
- Ocotillo Wash – 6914 E. Continental Mountain Drive

In addition, two residences were also identified by others as part of the Adobe Dam/Desert Hills ADMP:

- Apache Wash – 39416 N. 28th Street

In 1995, the District began considering the purchase of selected properties as an additional tool to mitigate flood risk. In general, eligibility criteria include (FCDMC, 2006):

- An inhabited residential structure located in a delineated 100-year floodway and built prior to designation (mapping) of that floodway
- An inhabited residential structure within a delineated 100-year floodplain that has a finished floor elevation below the 100-year base flood elevation or has experienced flood damage within the structure

The program is purely voluntary. Residents whose occupied structure meets these criteria and wish to have their property acquired may file an application with the District.

2.7 Public Education

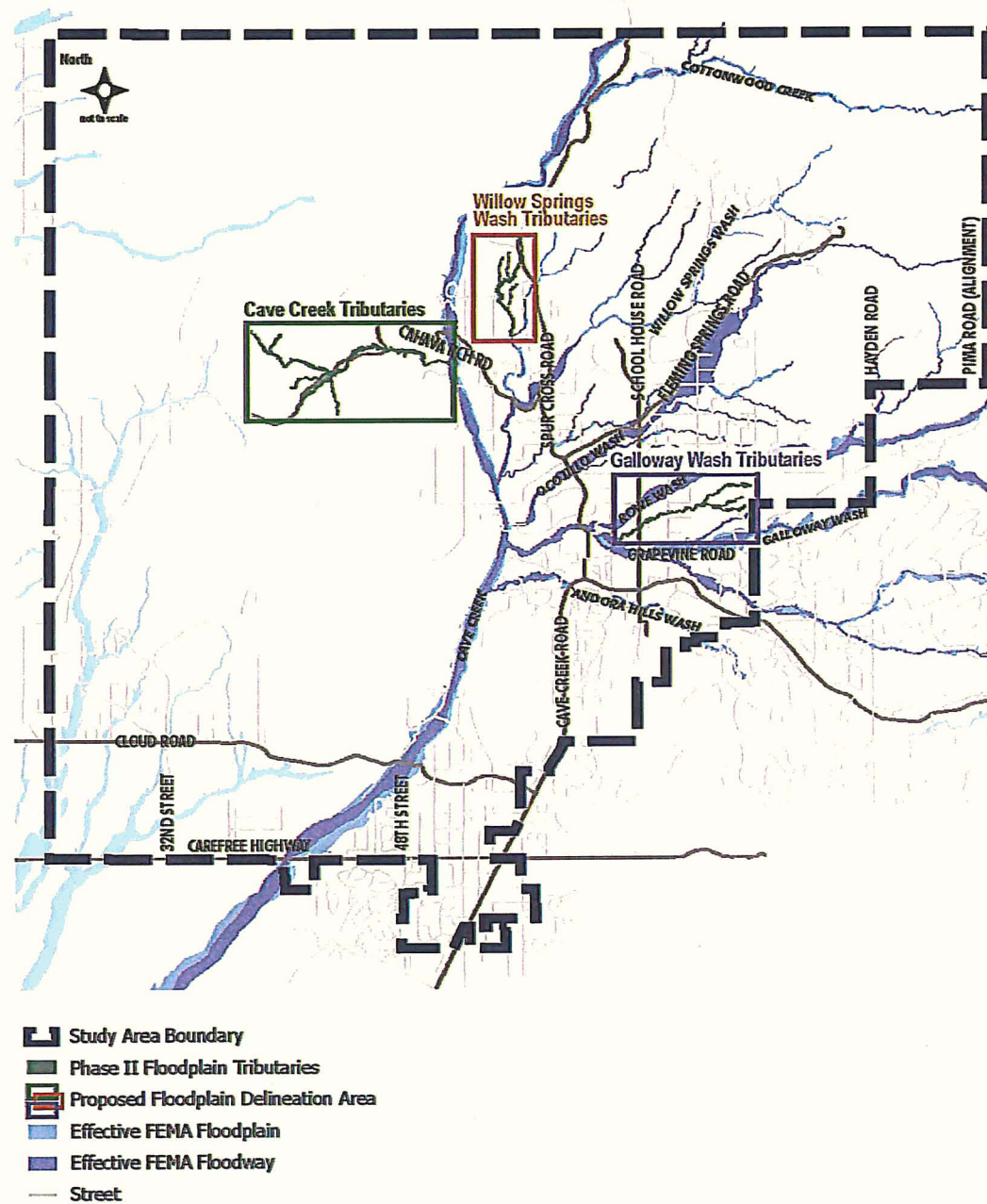
Public education is an important on-going effort that will be critical to the success of the Cave Creek DMP. Of particular concern is the continual education of new residents who may be unfamiliar with flood risks and mitigation practices. Information can be disseminated through the Town's Web site, brochures and posters at the Town complex and other public places, through the schools, and to the local news media. As a minimum, education campaigns should be launched before the start of each monsoon season.

2.8 Floodplain Delineation

Development of additional floodplain mapping will help prevent residents and developers from building in floodplains, avoid property damage and loss of life, and be usable for updating flood insurance coverage. Additional floodplain mapping was prepared as part of the DMP for portions of Ocotillo Wash and for tributaries of Cave Creek, Willow Springs Wash, and Galloway Wash. Refer to *Figure 2.8.1*, located on the next page, Proposed Floodplain Delineations Locations, from the October 24, 2007 Public Meeting, for a graphical illustration of the respective locations.



Cave Creek Drainage Master Plan Proposed Floodplain Delineation Locations



2601 West Durango Street, Phoenix, Arizona 85009, (602) 506-1501

www.fcd.maricopa.gov

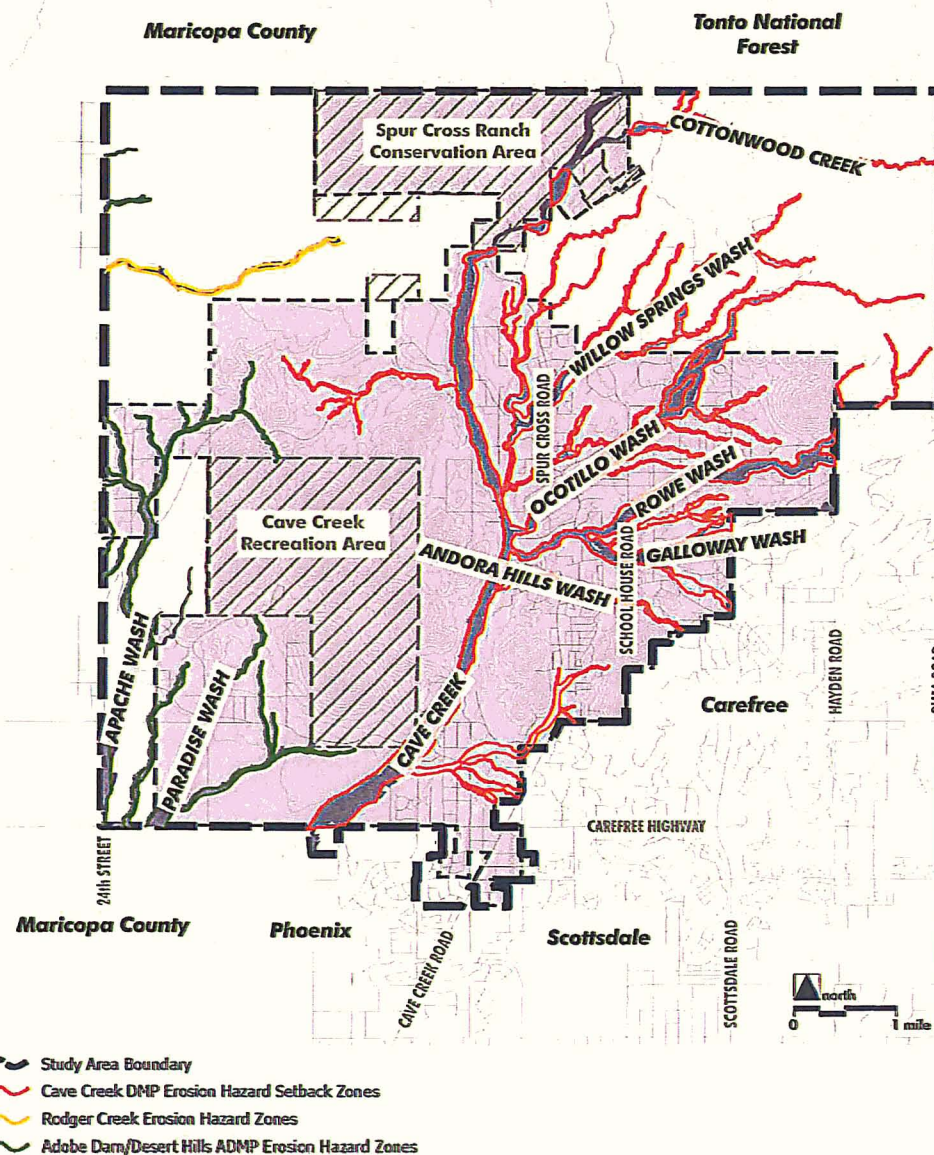
Figure 2.8.1: Proposed Floodplain Delineations Locations

2.9 Erosion Hazard Setback Zones

Setback delineations can be used to prevent homes or businesses from being built within in an area subject to potential erosion that is attributable to natural changes in the location of the wash over time. As part of the DMP, erosion hazard setback zones have been determined for the study area. Refer to *Figure 2.9.1*, located on the next page, Erosion Hazard Setback Zones, from the October 24, 2007 public meeting, for a graphical illustration of the resulting erosion hazard setback zones.



Cave Creek Drainage Master Plan Erosion Hazard Setback Zones



2801 West Durango Street, Phoenix, Arizona 85009, (602) 506-1501

www.fcd.maricopa.gov

Figure 2.9.1: Erosion Hazard Setback Zones

2.10 Potential Funding Sources

The Town and the District are expected to be the primary sources of funding for the Recommended Plan. The Town would fund a portion of the construction through its Capital Improvements Plan as resources allow. The District has a cost-share policy on drainage improvement projects, subject to its prioritization schedule. Other potential funding sources were evaluated for application to the recommended elements, as described below.

2.10.1 Federal Sources

Federal sources would be limited given the lack of federal projects in the area such as federal highways. The U.S. Army Corps of Engineers has provided funding in the past to flood control and flood warning projects in Arizona. However, funding for such projects has not been available in recent years.

2.10.2 State Sources

Arizona Department of Water Resources (ADWR) Flood Warning Unit of the Flood Mitigation Section has provided some assistance over the past ten years. The Town may wish to apply for assistance for additional precipitation and stage gages.

The Arizona Division of Emergency Management oversees homeland security funding for the state, and it is possible that certain elements of the Recommended Plan, such as all-weather access, might be eligible for assistance.

2.10.3 Additional Local/Regional Sources

The Maricopa County Department of Transportation (MCDOT) has recently completed the Carefree Highway Corridor Study, Interstate 17 to Scottsdale Road. Carefree Highway forms a large portion of the southern boundary of the Cave Creek DMP; as such, plan elements do not address Carefree Highway. However, it is important for the Town to address drainage concerns across the highway in conjunction with MCDOT's highway improvement project. Any additional involvement by MCDOT would be limited to county roadways.

The local development community will play a significant role in constructing the drainage and access infrastructure in the Town of Cave Creek. It is important for the Town and developers to cooperate in preserving and enhancing the natural drainage patterns in the Town.

3.0 TOWN ORDINANCES

3.1 Existing Ordinances

The Town has established zoning and subdivision ordinances to regulate the development and use of land within its boundaries. Key drainage ordinances are:

- Subdivision Ordinance, Section 4.2.A.3, which states: "The drainage system design plan shall insure that post-development runoff from the proposed subdivision shall not exceed the pre-development volumes and velocities discharged onto adjacent "downstream" property in accordance with Arizona law."
- Zoning Ordinance, Section 5.11.E.7, which states: "The entrance and exist points and continuity of all natural drainage channels on hillside sites shall be preserved."

The Town has additionally prepared the Draft Drainage Guidelines for the Town of Cave Creek. This document has not been adopted by the Town Council to date, but contains important additional drainage guidelines.

The ADWR and the District have additionally adopted regulations to control flooding and erosion. Many of the flooding and erosion problems within the study area can be mitigated by enforcement of existing regulations. With the adoption of the Drainage Guidelines, the need for additional ordinances is not anticipated.

4.0 IMPLEMENTATION RECOMMENDATIONS

Successful implementation of the Cave Creek DMP will result after completion of several important elements:

- **Adopt the Cave Creek DMP Recommended Plan.** The plan must be adopted by both the Cave Creek Town Council and the Maricopa County Board of Directors.
- **Solicit Public and Stakeholder Support.** An understanding of the plan elements and agreement by the stakeholders to support the plan is key to successful implementation.
- **Secure Funding.** Funding sources should be pursued as soon as possible, especially for construction elements such as bridge and culvert improvements.
- **Acquire Land.** Easements and rights-of-way would need to be acquired for the elements that require construction. Because of the area's rapid growth, opportunities for managing and mitigating flooding are rapidly diminishing and land costs are rising.
- **Proceed with Design Phase.** Several elements of the Recommended Plan will require preparation of design plans and specifications. These projects should proceed as soon as possible in order to reduce current flood and erosion risks to property and lives.
- **Obstruction Removal and Code Enforcement.** Several locations were identified where obstructions were placed in and or across both Major and Minor Washes. It is recommended that the Town enforce the code and have property owners remove obstructions from the washes.
- **Additional Floodplain Mapping.** Upon completion of obstruction removal from washes, it is recommended that additional floodplain delineation be prepared to preserve the natural corridors and prevent development with the floodplains.
- **Property Protection.** Individual property owners are encouraged to be proactive in protecting their residence against naturally occurring elements such as erosion and scour. The Drainage Guidelines, as well as the Town of Cave Creek Technical Design Guidelines #1 – Grading and Drainage, provide examples of tools available.
- **Public Education.** As part of the DMP, a program was created to provide public education regarding flooding and erosion hazards. Components of this plan include erosion hazards, motorist, and wash continuity education. A suggested program was prepared as part of the DMP and should be implemented as soon as possible.
- **Updated Web Site.** As a result of the DMP, it is suggested that the Town provide electronic copies of the final documents on the Town's Web site for use by the residents and developers. Enhance the Town's Web site to include education on flood and erosion risks with mitigation strategies.

5.0 OPPORTUNITIES AND CONSTRAINTS

Opportunities to implement the Cave Creek DMP include:

- Partner with the development community to preserve and protect the Town's natural drainage system and provide all-weather access.
- Adopt the Cave Creek DMP and the Town's Drainage Guidelines and enforce existing drainage regulations.
- Take advantage of the District's expertise in installing flood detection equipment. The District currently operates a very sophisticated flood detection system throughout the county, including Cave Creek, and is an excellent resource. Additionally, the District has been willing in the past to operate and maintain equipment purchased by a local community.
- The Town should seek opportunities to partner with developers, and potentially Carefree, to fund or cost share the civil improvements such as roads and wash improvements. As an example, the Town could partner with Carefree to improve Cave Creek Road for the proposed culvert improvements. Another alternative would be to partner with the developer of the land located at the northeast corner for the intersection of Cave Creek Road and Carefree Highway.

Potential constraints in implementing the Cave Creek DMP include:

- Lack of funding
- Insufficient staff resources to inspect new development and remediate code violations
- The District's Floodplain Acquisition Program is strictly voluntary. If eligible residents decline to pursue a buy-out, they remain at high risk for flooding.

6.0 REFERENCES

Recommended Alternative Report, Adobe Dam/Desert Hills ADMP, FCD #2002C001, FCDMC, Various dates from 2003 through 2005.

Flood Control District of Maricopa County, "Residential Structure Floodproofing Floodprone Properties Acquisition", September 2006.